

Towards Practical Guidelines and Recommendations for Using Robotics Pets with Dementia Patients

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Abstract. This paper describes a path to practical guidelines for professional caregivers and family members who want to use pet robots in the care for persons with dementia. It reports how a literature study, which included the use of related techniques, was combined with interviews with professional caregivers and field studies. The result of this triangle approach is an outline of directives and recommendations, represented in a practical set of guidelines.

Keywords: robot assisted activity, social robots, multidisciplinary research, triangulation, dementia care

1. Introduction

The general goal of using pet robots in the care of people with dementia is to increase their feeling of health and wellbeing, and to decrease anxiety. They stimulate them to be more communicative and enable caregivers and family members to make contact with them - they calm down or indeed revitalize, are less anxious and/or confused, feel less lonely and/or depressed, are happier and laugh more, remember earlier times (reminisce) and communicate more and better with their surroundings (Bemelmans et al. 2012, Broekens et al. 2009)

But how are these effects reached? How to use the robot? For which clients are pet robots suitable or and for which ones not? What do you have to watch out for? How to work with groups of people or an individual client? When and how do you involve relatives? These are a few of the many questions care professionals, volunteer caregivers and family members who (want to) work with pet robots have (Heerink, 2012). There is a need for information and practical guidelines when using pet robots in the care of people with dementia (Heerink et al. 2013a).

To meet this need the project “New friends, old emotions” was initiated at the end of 2012. In this project Windesheim University and Zuyd University together with professionals from 6 participating care centers for the elderly and with the Spanish knowledge partners LaSalle Ramon Llull University” and the CIEN Alzheimer Foundation of the Carlos III Institute for Health, carried out practice oriented research into the use of various robotic animals(1) in individual patients and in groups, (2) in various stages of dementia (3) in cooperation with professional caregivers, relatives and volunteers and give as many ‘evidence based’ answers

as possible to the questions listed above. The findings were to be translated into a set of guidelines and recommendations for the use of pet robots in dementia, to be disseminated in a practical handbook, a series of workshops for care professionals and academic publications.

Our main research question was: *How can professionals in the care of older people with dementia work effectively with robotic animals?*

By "effectively" we mean that there is a positive effect on the quality of life. In addition, we engage both the perceived quality as the objective effects observed. With this in mind, we aimed to answer the following questions:

1. What care-related requirements and preconditions for working with robotic animals emerge from literature and experiences of care professionals?
2. To what extent can different types available robotic animals be applied?
3. What factors support the therapeutic use of a robotic animal in this context?
4. What practical evidence-based guidelines for working with robotic animals in the care of older people with dementia, can be derived from literature, new knowledge from field research and the experiences of professionals?

In the following sections we will describe how we developed these guidelines and recommendations based on a triangulation research setup and give an impression of the developed guidelines.

2. Method

An obvious approach to gather knowledge is literature search. However, as we will discuss in section 3, much research has been done to describe the effects of robot assisted therapy, but there are very little detailed descriptions of therapeutic approaches. We therefore expanded our search to related techniques. Furthermore, we collected data from field experiments (trials) and gathered experiences of professionals who had worked with robotic pets.

The developed guidelines were primarily published in a book (originally in Dutch, but currently translated into English and Spanish). Besides this, we developed practical workshops in which caregivers are able to experience and exercise working with robotic pets.

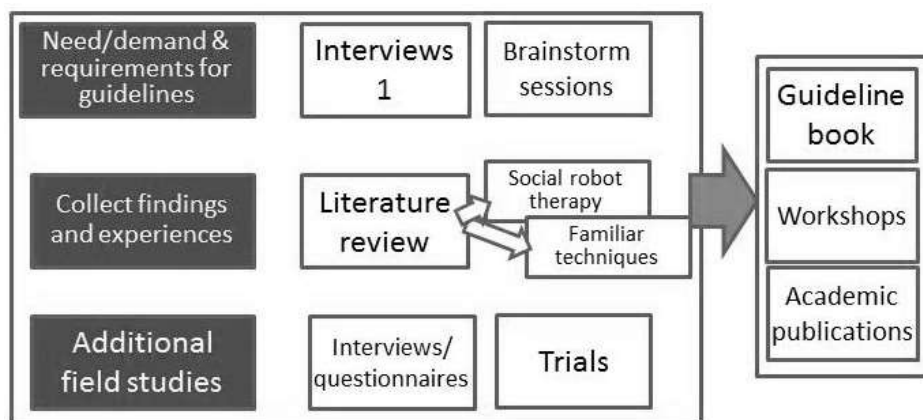


FIGURE 1. Research strategy

3. Related research literature

For over a decade pet robots have been used in the care of older adults with a wide variety of problems. Various studies have shown that pet robots have a positive effect on the health and well-being of people suffering from dementia, by stimulating the senses, decreasing anxiety and stimulating interaction (Bemelmans et al. 2012, Broekens et al. 2009). A large number of these studies concerns the use of Paro, a seal robot, which was carried out in Japan. This especially takes into consideration the experiments which took place in a care home or a daily activity center for the elderly (Shibata, 2004-2005; Wada, 2005-2008; Wada & Shibata, 2007). There was only a limited translation into practice made during and after these studies on the effect of robot therapy and no indications on how these effects can best be realized or optimized by caregivers. As a result of this shortage, research was performed into the existing literature in the following areas: 1) the experience of users of pet robots (care professionals, persons with dementia and volunteers working with them) 2) existing manuals and guidelines for similar interventions such as sensory sessions, therapies with dolls/cuddly toys and therapies with (domestic) animals.

The first literature study (February – March 2013) derived information based on experiences of the professional caregivers, patients and volunteers when using pet robots. The search regarded international literature of therapies and activities with pet robots in the care for persons with dementia, the care for handicapped persons and mental healthcare. Databases that were used were Cinahl, Pubmed Cochrane Library, PsycINFO, Picarta and Google Scholar, on robots, robotic(s), robot assisted, in combination with socially assistive, therapy, activity, intervention, animal, pet, social, companion, therapy, activity, elderly, older adults, dementia and in the second stage with scent, aroma, sound, music, tone, practice, guidelines, recommendations, snoezelen, multi-sensory, toy and dolls.

The initial result of 661 references was filtered on double appearances and relevance as indicated in titles and abstracts, which resulted in a selection of 110. After these were analyzed for indications for guidelines and recommendations, a final list of 23 articles was created. A total of eighteen articles concerned robot therapy with Paro. Five described the use of robot cats NeCoRo and Cleo (Libin & Libin 2003, 2005), robot dog AIBO (Banks et al. 2008) and the Nabaztag (Klamer & Ben Allouch 2010), a communication robot in the shape of a rabbit.

3.1. Type of robot

Most studies concerned robot therapies with Paro, the ‘seal robot’. All cases focused on activities with polder adults. Other articles described activities with robot cats NeCoRo and Cleo (Libin & Libin 2003, 2005), robot dog AIBO (Banks et al. 2008) and the Nabaztag (Klamer & Ben Allouch 2010), a communications robot in the shape of a rabbit.

3.2. Reported experiences of care professionals

When the opinion and experiences of professional caregivers is mentioned we refer to staff working in a residence for older people and people with dementia. Their experiences were in general of a positive nature, observing positive changes in behavior during and after interaction with the robot. They especially noticed positive effects on the communication and interaction between themselves and the people they care for and also between the elderly people (Banks et al. 2008, Calo et al. 2001, Pedersen 2011, Robinson et al. 2013).

The robot offers opportunities for the caregivers and clients to talk with each other about the the appearance, movements and reactions of robot, its appearance and its movements and reactions. It was also observed that the residents became more active and happier through contact with the robot. The general picture of the experiences of the care professionals shows that robot therapy improves the general wellbeing of the client and creates a better atmosphere. In the more discerning experiences of the care professionals it is noted that pet robots are not suitable for every dementia patient. Some elderly people are afraid of the robot or due to some other reason do not want to take part in the activities with the robot, e.g. because they do not like animals or because they become agitated by the sound of the robot.

Also some caregivers question whether the elderly people are stigmatized when allowed to “play” with a robot. They have the idea that the elderly people would be made to look like fools because they find it difficult to differentiate between a robot and a living animal when approaching it. Also mentioned is the need for guidelines and methodology for using pet robots by caregivers.

The professionals do not often know how to handle the robot exactly or how to use it to an advantage for the care of their clients.

Experiences of informal caregivers: it has been highlighted in the literature that the children of parents with dementia find they are able to communicate more easily with their parents thanks to the robot. They see that it helps their parent(s) in expressing their emotions and feelings. They see that their parents laugh more and have fewer problems with loneliness. Just like the care professionals the informal caregivers think that the robot is less suitable for people who do not like animals or cuddling. Furthermore they also experience the need for guidelines when offering the pet robot (Shibata et al, 2005; Wada et al, 2002, Weingartz, 2011).

3.3. Reported clients experiences

In general the experiences of clients with pet robots are positive, finding it is nice to make contact with the robot. They become contented and feel less lonely when the robot is close, encouraging them to talk. The robot causes clients and visitors to sit closer together and to talk to each other (Calo et al 2001, Kidd et al. 2006, Klamer & Ben Alouch 2011, Libin & Libin 2003, 2005, Robinson et al. 2013, Roger et al. 2013)

The elderly in a care home or a nursing home notice that the atmosphere in the group is better when the robot (Paro) is present. In some cases the clients rename the robot or sing songs for him. Women in particular treat the robot as if it is a (small) child/baby. Men are often more interested in the technical side of things, and want to know how the robot works. There are also clients who don't want to do anything with the robot because it is not a real animal or they are afraid of. Others, especially male clients, think it is childish or effeminate to play with such a cuddly toy or they find it boring because the robot cannot talk.

3.4. Reported experiences with related interventions

Therapy or activities with pet robots share some characteristics with more familiar interventions, such as sensory therapy and therapy with real (domestic) animals, or with dolls and cuddly toys. The most important similarity is that all these interventions, just like robot therapy are aimed at stimulating the senses and decreasing anxiety (Powell 2012, Klages 2011, Verkaik et al. 2005). Because these interventions exist and have been implemented over a longer period of time, manuals and a professional methodology may have already been developed. This is the reason why the existing literature was looked into for guidelines for these interventions.

The following related interventions resulted from the literature analyses.

- *Snoezelen*, or *sensory therapy* is an activity designed to stimulate the senses, and that is why it is sometimes called sensory activation. Sensory therapy is designed to positively stimulate the senses. We define Sensory therapy as a method directed at the

active stimulation of the senses, hearing, touch, sight and smell, in a client friendly and trusted environment. (Verkaik et al. 2005).

- *Therapy with dolls and cuddly toys*, in this case non mechanical dolls and cuddly toys are used in the care of people with dementia.
- *Therapy with animals*, also known as *animal assisted therapy*, has been applied in the treatment and guidance of a range of target groups for several decades. This term is applies to all types of animal therapy. The use of (domestic) animals, such as cats dogs rabbits horses and dolphins frequently occurs (Powell 2012).

When researching into the (international) literature on these related interventions many articles and studies were found regarding the effects and application of sensory therapy. No useful literature was found on the use of therapy with dolls. There was also little found on therapy with domestic animals. The results of the related interventions which are described here come mainly from the studies which were directed at sensory therapy as a therapy or activity for elderly people with dementia.

It appears from the literature that sensory therapy has similar positive effects to those which are achieved when using pet robots: it is able to produce improved wellbeing and behavior in people with dementia. This means that people with dementia during and/or after participation in a sensory therapy activity show more happiness are more active and have more interaction and communication with their surroundings. Furthermore sensory therapy can result in less apathy and agitation in people.

The possible effects of animal assisted therapy are similar to those of sensory therapy and robot therapy. This allows people with dementia who have had animal assisted therapy to possibly become less apathetic and agitated in their behavior. In addition it could calm the people with dementia down resulting in them showing an improvement in social behavior, demonstrated by more laughing and talking and more interaction with their surroundings. In short, just like robot therapy related interventions such as sensory therapy and animal assisted therapy can be effective especially in the communication and interaction between clients.

Looking for guidelines and recommendations in literature on snoezelen, we first of all found that snoezelen, sensory therapy and multisensory stimulation are one and the same which is usually offered in a defined method. The activity takes place in most cases in a separate space which is specially designed for the purpose of sensory activities. This means that the space is designed with amongst other things various colored lamps, mirrors, music and perfumed oils (Pinkney, 1997). A sensory therapy session is generally of an individual nature (one to one guidance) and takes on average half an hour.

A sensory therapy session is usually guided by a member of staff who is specially trained in the application of the sensory therapy method.

In literature on animal assisted therapy we found very little practical directives, since it has a less predefined way of applying the therapy compared to sensory therapy. Most of the time it takes the form of visiting dogs or cats which for a certain time are allowed into the living quarters or communal areas of the participants. This could take place on an individual basis or in a group session. The animals are usually accompanied by their owners or trainers. This could be a care professional from the institution, but is more often someone from outside the institution who is not specifically trained to work with the animal and the inhabitants of the institution.

Guidelines for sensory therapy were most commonly found in the literature, sometimes in the form of a manual. This overview was laid alongside the above description of the experiences with pet robots.

3.5. Results from additional studies

Within the project field studies in the form of trials were undertaken with people with dementia and supplemented by interviews with care professionals in Spain and the Netherlands (Heerink. 2013 a en b, Heerink 2014, Valenti-Soler 2015). In these studies we wanted to (a) establish the preference for and reactions to *different types* of animals by caregivers and dementia patients, (b) collect additional experiences of care professionals with robotic pet.

To enable us to answer the first two questions we observed the reactions of people with dementia in field studies, in April 2013 and June and July 2014, using seven different robotic animals: a dog, a cat, a teddy bear, a seal, a monkey, a penguin and a koala bear. The animals were all of a similar size, approximately 30 centimeters long, and all were able to move their arms and heads when touched. When doing this, they also made a soft squeaking sound adapted to the natural sound of that type of animal. The reactions to the pet robot by people with dementia were observed in two conditions: when the pet robot did not move or make a sound (switched off) and when they did move and make sounds.

The interest in the seal did not seem to be greater than that in the dog or cat. The interest in the monkey and koala was marginally less. The penguin hardly scored at all and the teddy bear was just the same as that in the seal, cat, and dog.

Our conclusion that the seal was not always the most suitable form was confirmed by the professional care givers. Many of them seemed to have experience with cheap robots from the toyshop. Sometimes this was due to a limited budget: seal Paro cost around € 6,000,

compared to the cost of a robotic animal from the toy shop at around € 50. They noticed that for many of the activities these cheap animals were effective enough, sometimes even more so due to the fact that they were much less heavy than Paro.

Furthermore we noticed strong personal preferences; people who hardly reacted to the seal often reacted much more positively to a cat or a dog. Others reacted even more strongly to a monkey or a koala bear. A therapist in Madrid called us when she realized she actually needed a whole box full of animals to be able to work with all the people in her group.

4. Examples of Derived Practical Guidelines and Recommendations

In this section we will give a few directions for the application of the robotic animals which are on sale at the moment. It goes without saying that both manufacturers of care aids and toy manufacturers will be working on new animals.

4.1. Usable robotic animals

There are robots which have been especially developed for people with dementia such as Paro, which costs around € 6,000 and JustoCat, which costs around € 1.450. Both robots are quite heavy (almost 3 kilos). Paro is without a doubt the most sophisticated, with five sensor types including advanced touch recognition, recognition of light and dark and even daily routine, identifying sound direction, recognizing its name, adjusting to remembered interaction and accurate emotion expression.

JustoCat is a little more simple: he feels when he is being stroked and petted, and therefore purrs, is warm, you can feel him shudder when he purrs. One advantage is that the fur coat is removable to enable washing. Unfortunately that is not possible by Paro.

In addition to these, toy animals are often used, like the *Wowwee Alive* series, in which a seal can be found, and the *Furreal Friends* manufactured by Hasbro. Especially the cat 'Lulu' is often used. Most of these toys will cost between € 40,- and € 60,-.

The toy animals are easy to use especially in group activities, when several robotic animals are used simultaneously. They will not have the same impact as Paro and JustoCat, due to the fact that they are so light and make more mechanical sounds. The "Feeling of a toy" that springs to mind by the user is strengthened by the fact that there is an on/off switch under the cat's fur which can be pulled or zipped open. The correct switch is not always easy to find there.

Unfortunately toy animals usually are only available for just a few years in the toy trade. However, there is a plentiful supply via Internet trading sites such as eBay.

Pet robots do not always have the desired effect on everybody. It is difficult to point out which person is or is not suitable for the introduction of a robot. Pet robots are in principle suitable for everybody, as long as it matches the needs and wishes of the individual. In practice this calls for insight into the person and situation from the professional caregiver.

Based on practical experiences it seems that pet robots have most effect on people:

- In the later stages of dementia (phase 3);
- Who have or have had (domestic) animals themselves;
- Who have difficulty with making contact

The robot can be used in moments of unrest, sadness, aggression: to calm down the clients, in moments of inactivity: if wished to stimulate the clients. The robots can also be used as an aid to make contact with the clients should they have become introvert.

When family or visitors come round they may use the robot to stimulate the client, reduce tension, to improve the atmosphere, to provide a stable situation and/or as a means of contact.

4.2. Directives and recommendations for activities

A few possible methods of working with the pet robots will now be given. After drawing attention to several points for attention we will give an example of the method of working by a group activity and an activity with an individual client in two different situations: the stimulation of a client and the prevention of unrest by a certain care procedure.

Establishing suitability for the client

Pet robots do not always have the desired effect on everybody. It is difficult to point out which person is or is not suitable for the introduction of a robot. Pet robots are in principle suitable for everybody, as long as it matches the needs and wishes of the client. In practice this calls for insight into the person and situation from the care professional.

Based on practical experiences it seems that pet robots have **the most effect** on people:

- In the later stages of dementia (phase 3);
- Who have or have had (domestic) animals themselves;
- Who have difficulty with human contact.

It is important not to leave the client alone with the robot. This is to prevent any escalation of or negative effects. The client's feelings and emotions may run high during the activity with the pet robot. It is therefore important that there is always someone close by to guide and support the client when using the pet robot

Knowledge, skills and policy

It is important for the care professional to know how the robot works and how it could/ should be applied in practice. This is to ensure the safety and most effective way of using the robot during the activity . Furthermore, as mentioned earlier , the knowledge and experience with the target group, of the care professional is indispensable when working with the pet robots. When and how to use the robot depends greatly on the insight of the care professional.

It is recommended that a protocol be set up for the use of the pet robot within the care institution, so that professionals all use the same method.

Preparation of activities

It is recommended to offer the robot to the client in a safe and trusted environment. In most cases this will be their own room or a communal living room which is the most suitable.

It is recommended to keep the pet robot in the same place all the time. It will depend on the client(s) and/or residents of the care home which option is the best. The robot can:

- Remain In view of the client(s), e.g. in a cage or a basket. It is possible to choose free access (clients are allowed to pick up the robot whenever they wish) or access at specific times or when the client(s) request it.
- Remain out of view of the client(s), e.g. in a cupboard or in the staffroom.
- In moments of unrest, sadness, aggression: to calm down the clients.
- In moments of inactivity: if wished to stimulate the clients.
- As an aid to make contact with the clients should they have become introvert.
- When family or visitors come round : to stimulate the client, reduce tension, to improve the atmosphere, to provide a stable situation and/or as a means of contact.

In general it is recommended to let the activity last no longer than 20 minutes. Of course the durations depends on the person and the situation. It is important to be aware of overstimulation of the client due to the sometimes unexpected emotions and behavior caused by contact with the robot.

There are many ways in which the pet robots can be applied. Here once again the most suitable way depends on the person and the situation. The advice would be to experiment with this. See what works for which client and in which situation and keep a report of this. A few examples of more specific methods of working will be given In the next paragraph .

Points of attention

Attention should be paid to the following points before during and/or after the activity:

- Take care that the robot is fully charged. Clients may become confused or emotional if the robot breaks down during an activity.

- Remain with the client during contact with the robot in order to guide and counsel the client should feelings and emotions arise.
- Remain in contact (talk with and/or touch) the client and robot during the activity.
- Robot or living being? Allow the client to decide whether or not the robot is treated as a robot, cuddly toy or a real animal. If the client asks what is it, reply for example with “What do you think it is?”. This will enable the perception of the client of their surroundings to be adhered to as closely as possible.
- Evaluate the activity(possibly with the client) and report about it so that this can be taken into account during the following contact moment with the pet robot.
- Give the robot (possibly together with the client) a name or use the type of animal (e.g. seal, cat or dog).

Groups and individuals

Both working in a group and individually are possible. The advantage of working with an individual client is that the care professional can more easily adjust the activity to the needs of that client or situation. While working with groups it has been noticed that some clients have difficulty in “sharing” the robot, therefore that they do not want to give him to another person. Experience teaches us that offering the robot in a group has a positive effect especially on the communication and interaction within the group and thus improving the atmosphere in it.

A few recommendations for group activities:

- Introduce the pet robot to the group by saying for example: “Look what I’ve got here”
- Lay the robot in the middle of the group and then watch and wait to see what the reactions are.
- Describe the robot : say what he likes, what he looks like and what he does.
- Talk to the robot yourself and stroke the animal.
- Ask the participants if they would like to stroke or hold the robot.
- Possibly introduce the robot again when you lay him in the lap of a client.
- Ask the participants what they think of the robot.
- Say good bye to the robot together by saying for example : “The seal is going back in his basket now to sleep” or “See you again next time seal”.
- Allow each participant to say good bye in his/her own manner.

Stimulation of an individual client

- Introduce the robot by saying for example “look Mr/Mrs, This is a seal, he is coming to sit with you for a while. You can pick him up or you can leave him on the table”

- Lay the pet robot down during the activity so that the client is able to touch him whenever he/she wishes.
- Keep reminding the client that the pet robot is there.
- Describe the robot: what he does, what he looks like and what he likes.
- Talk to the robot yourself and stroke the animal in order to encourage the client to do the same.
- Ask the client what he/she thinks of the robot.
- At the end of the activity, say good bye to the pet robot together by saying for example “Seal see you next time. Would you like to say something to the seal Mr/Mrs.....?”

Prevention of agitation during the care activity

- Introduce the pet robot before the care activity takes place. For example by saying : Look Mr/Mrs .. , this is a seal, today he is going to ..(go to the toilet) with you”.
- Make sure that the client is able to touch the pet robot during the care activity, by for example sitting him on a stool next to the client.
- Do not just talk to the client but also talk to the robot as well. Remind the client that the robot is there. Talk about the robot and involve him in the activity in order to distract the client, if necessary.
- Say goodbye to the robot together at the end of the activity.

5. Conclusion and further research

In this paper we demonstrated how practical guidelines can be developed using an iterative, stepwise approach: literature, interviews and questionnaires, and field studies. However, we have to note that his quest for guidelines and the subsequent approach was motivated by the urgent need for guidelines as expressed by care professionals and subsequently the study was in many aspects explorative and limited in numbers and scale. Moreover, the results can only be *called evidence* based if we accept a broad definition of this term. This means many findings can be found acceptable for practice, but there is still a lack of clinical studies, involving different types of robotic pets, used in dementia care. Nevertheless, it is the first study to focus on the translation of research into practical guidelines for the use of pet robots in the care of persons with dementia which uses this approach.

Moreover, this project shows the value of experiences of professional caregivers that go far beyond the directives and indications that can be derived from present research literature. We found that this concerns not only experiences and developed practices with pet robots, but also with related practices, like working with animals and applying sensory therapy.

Thus, if thoroughly explored and developed into sound hypotheses, the findings in the project “New Friends, Old Emotions” can be the bases of future theoretical and empirical research.

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